Presentation at the First Plenary Meeting of the Advisory Committee on Acoustic Impacts on Marine Mammals

3-5 February 2004

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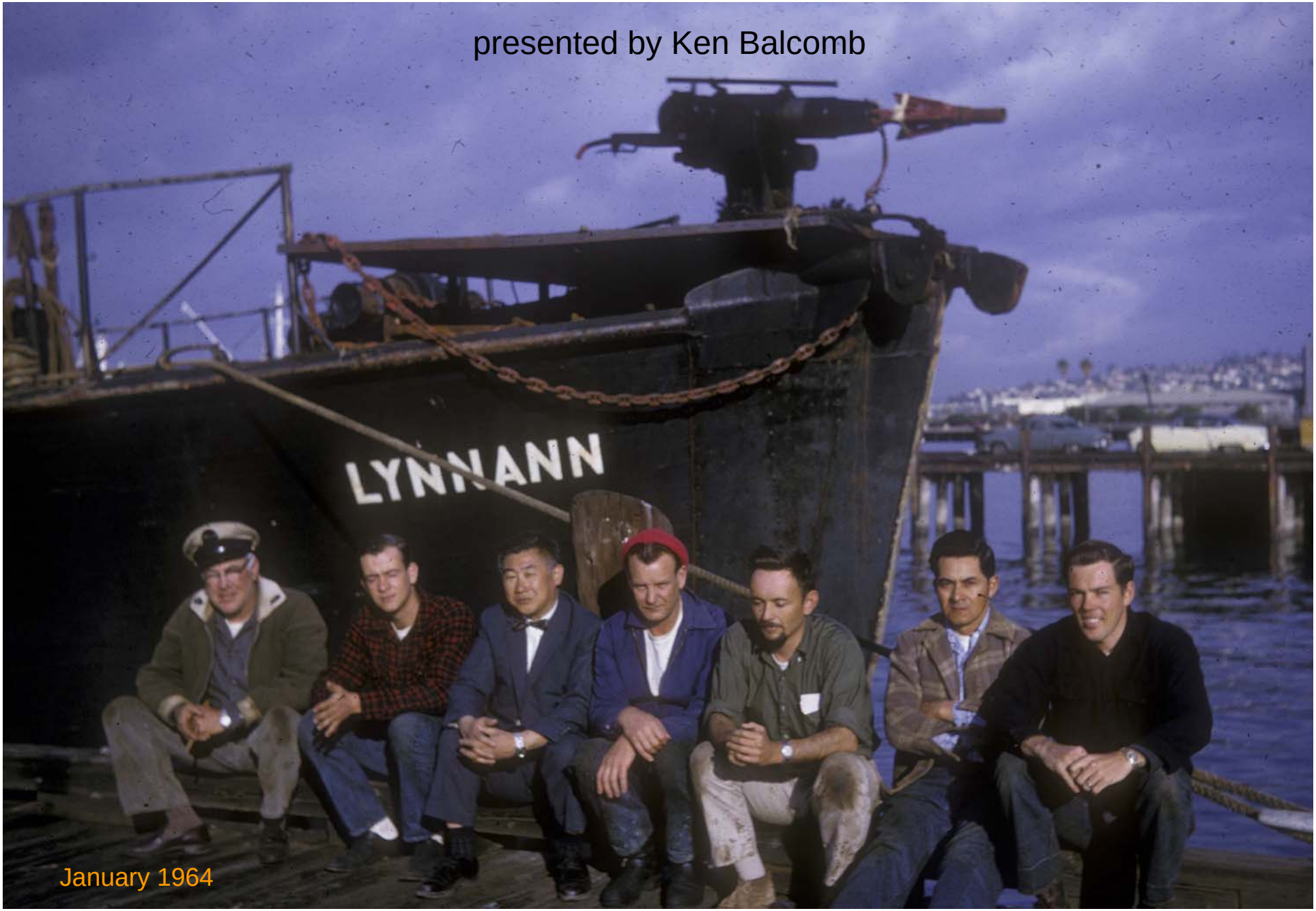
Field Observations of Impacts on Cetaceans

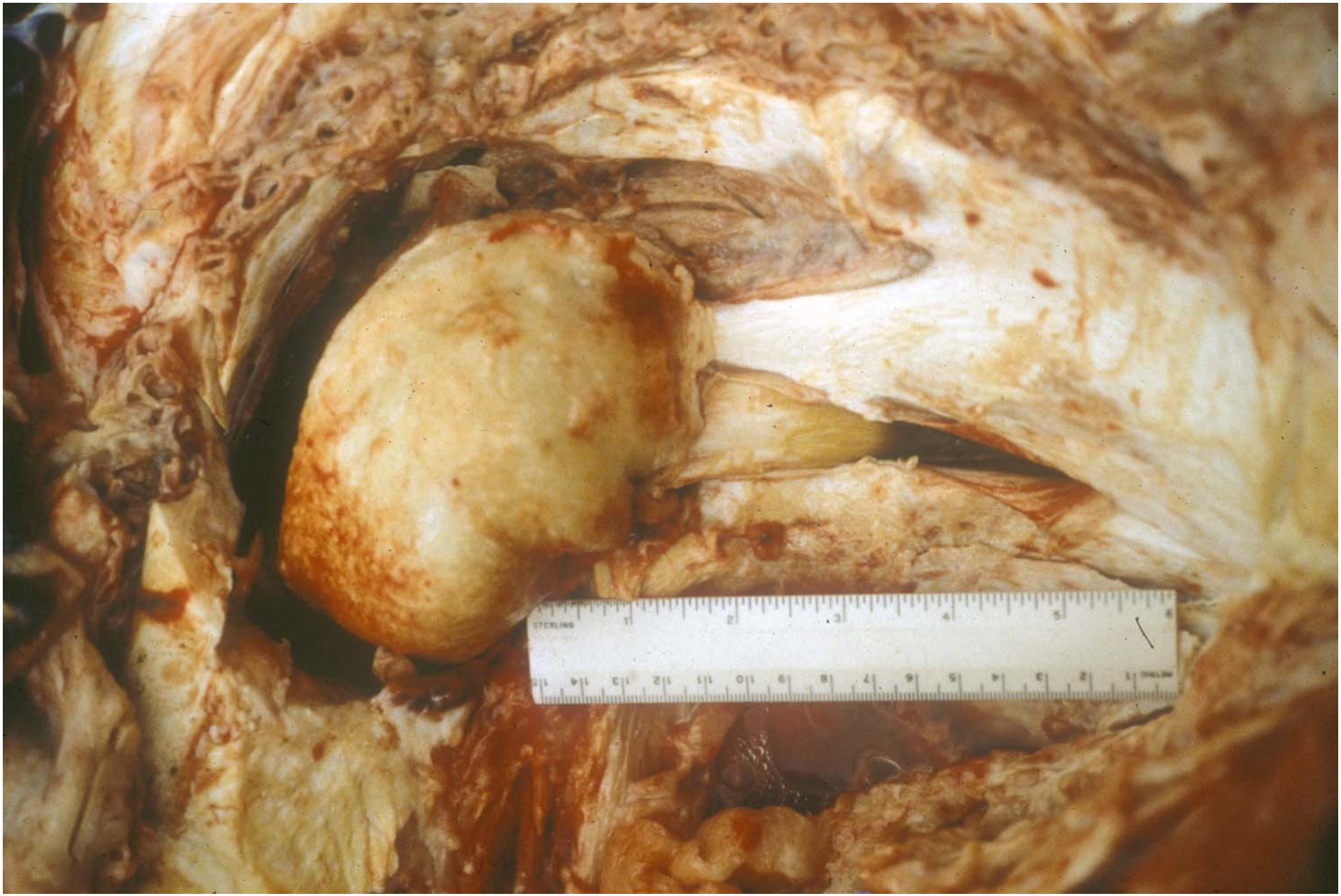
presented by Ken Balcomb



January 1964

Commercial Whaling offered many opportunities to examine control specimens

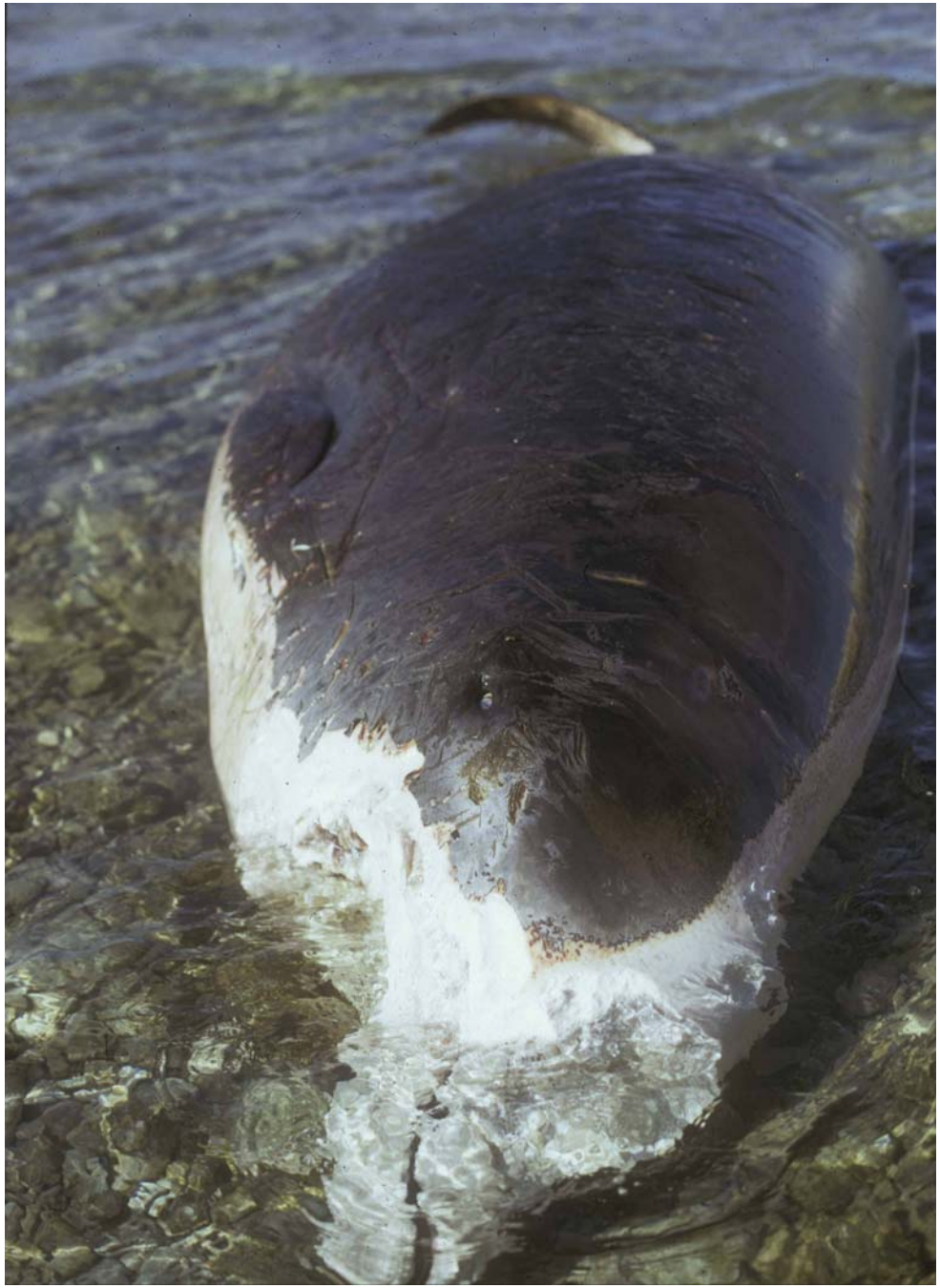
Earbones and Tympanic membrane of Mysticetes were routinely removed for aging studies using “wax plug” in internal auditory meatus.



Odontocetes were aged using tooth layers, but their earbones can also be dissected out for comparing the auditory anatomy to Mysticetes.

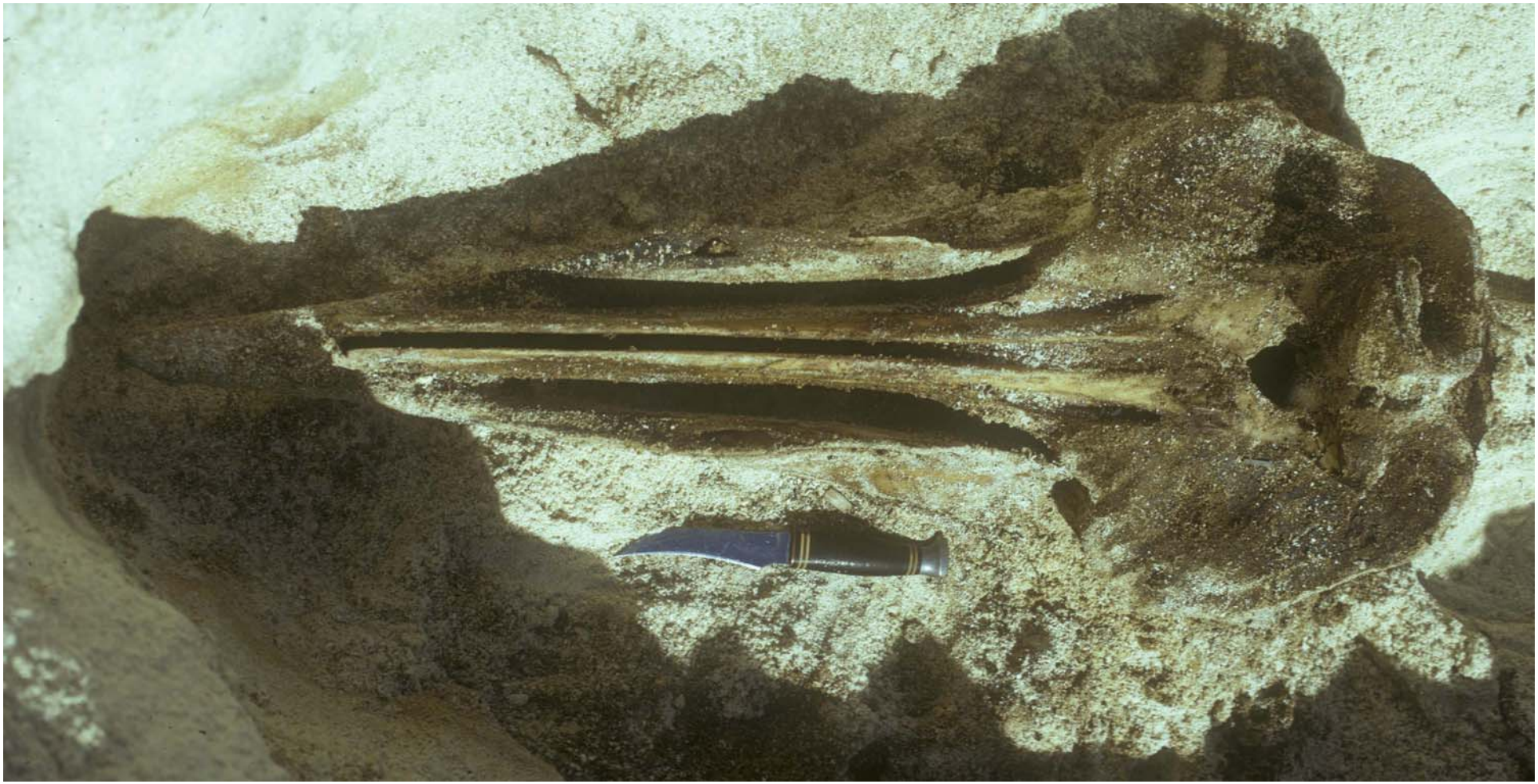
I spent hundreds of hours at sea and at whaling stations studying whales, and had seen most species, but in 1966 I saw a type of beaked whaled never reported before in the flesh. It took 30 years and many observations by others to finally identify the species. In the process, beaked whales became a fascination.

I joined the Navy in 1967 and trained as an aviator to go to sea and hopefully have opportunity to observe these and other whales in aerial view. I was assigned as Operations Officer at NAVFAC Midway (SOSUS), and was almost immediately greeted by a stranded Cuvier’s beaked whale.



A month later, I exhumed a “porpoise” that had been buried in 1969. Eyewitness observers of the stranding reported that it swam to the beach and died while they were attempting to push it back out to sea.

Perhaps because of their deep-diving habits and generally offshore distribution, beaked whales have historically been sparsely represented in strandings, and most of these were of solitary indivuiduals. This was the second known female specimen of M. densirostris when collected in 1970 at Midway Island.



Fresh Cuvier's Beaked Whale at Midway Island, August 1971

Two Cuvier's Beaked Whales examined while on Midway Island

I extended my tour of duty in the Navy for an opportunity to be stationed in Japan, where in off-duty hours I could examine more small cetaceans taken in commercial fisheries.

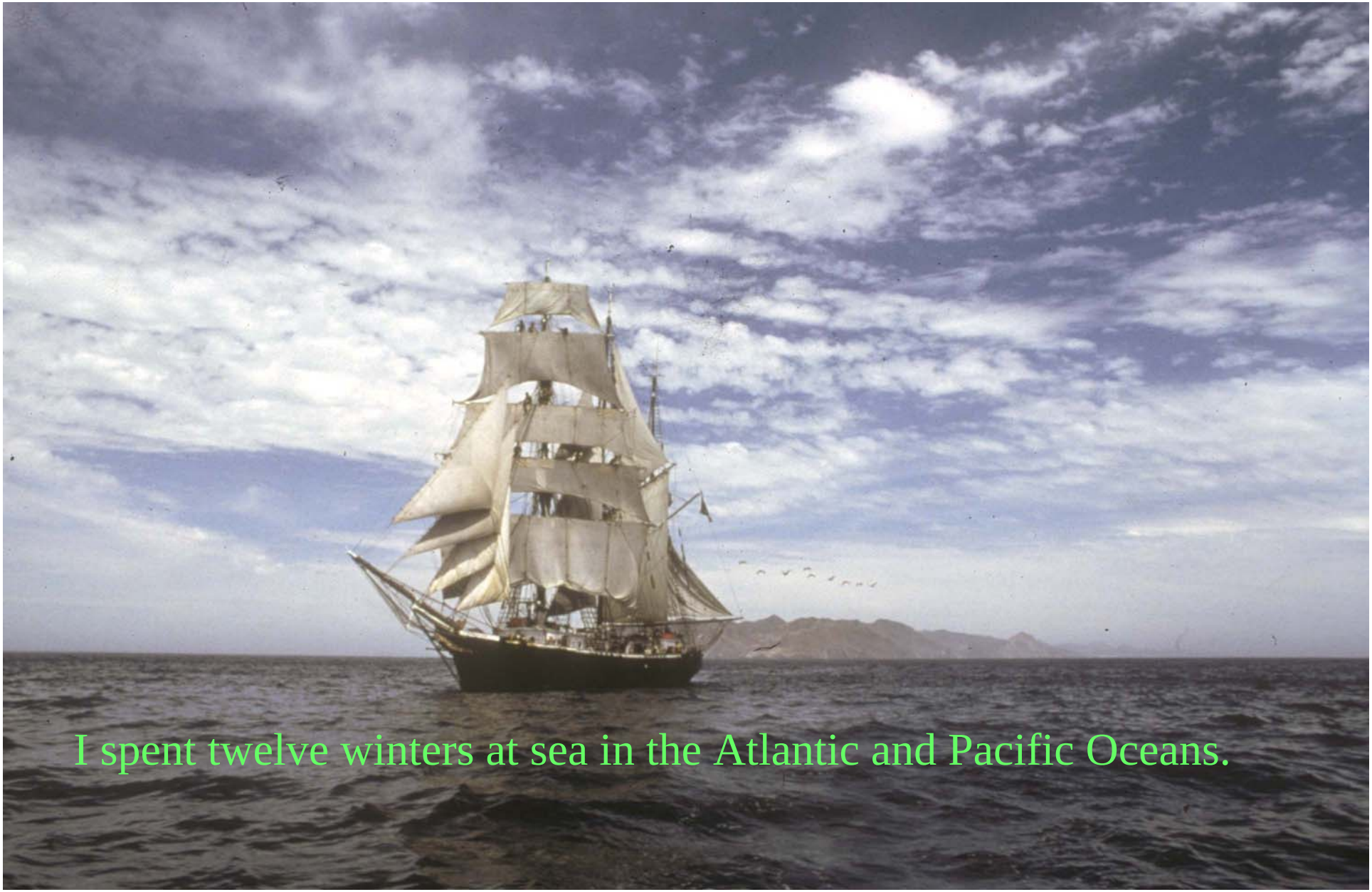

Organized commercial whaling began in 1606 at Taiji, Japan and was documented in writing and in scrolls.
“Oikomi” drive fisheries were developed whereby whales were herded and trapped by underwater sounds produced by striking semi-submerged pipes and poles from small boats.

Modern small cetacean fisheries offer opportunity to examine specimens.

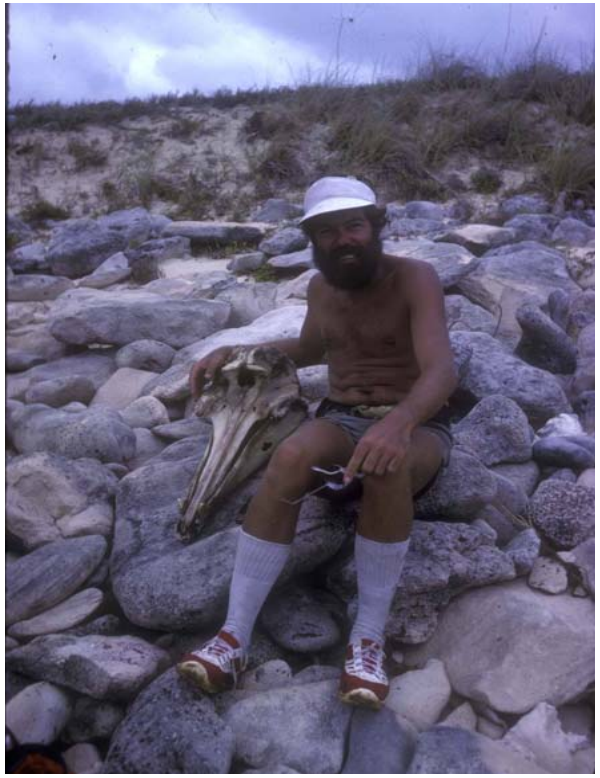
Some fisheries take hundreds to thousands of animals each year by “oikomi”.

There are some fisheries directed at beaked whales. The anatomy of these whales is particularly interesting because of their deep-diving habits. There is opportunity to examine many fresh specimens.

In 1976, I signed on as Chief Scientist aboard the oceanographic research vessel “Regina Maris” in order to conduct studies of living whales.



Two Beaked Whale Specimens Collected



during research expeditions in Bahamian waters.


I spent summers in the Pacific Northwest conducting photo-identification demographic studies of killer whales.
These studies were so intimate and revealing of the life history of these whales that I decided to initiate similar studies for beaked whales.

Beaked Whale Studies in the Bahamas

Initiated in Winter of 1991 in order to learn about behavior and life history.

The first challenge we faced was figuring out how to get close enough to these shy animals to photo-identify individuals. The second challenge was to determine if we could repeatedly identify individuals. We accomplished both tasks within three years.

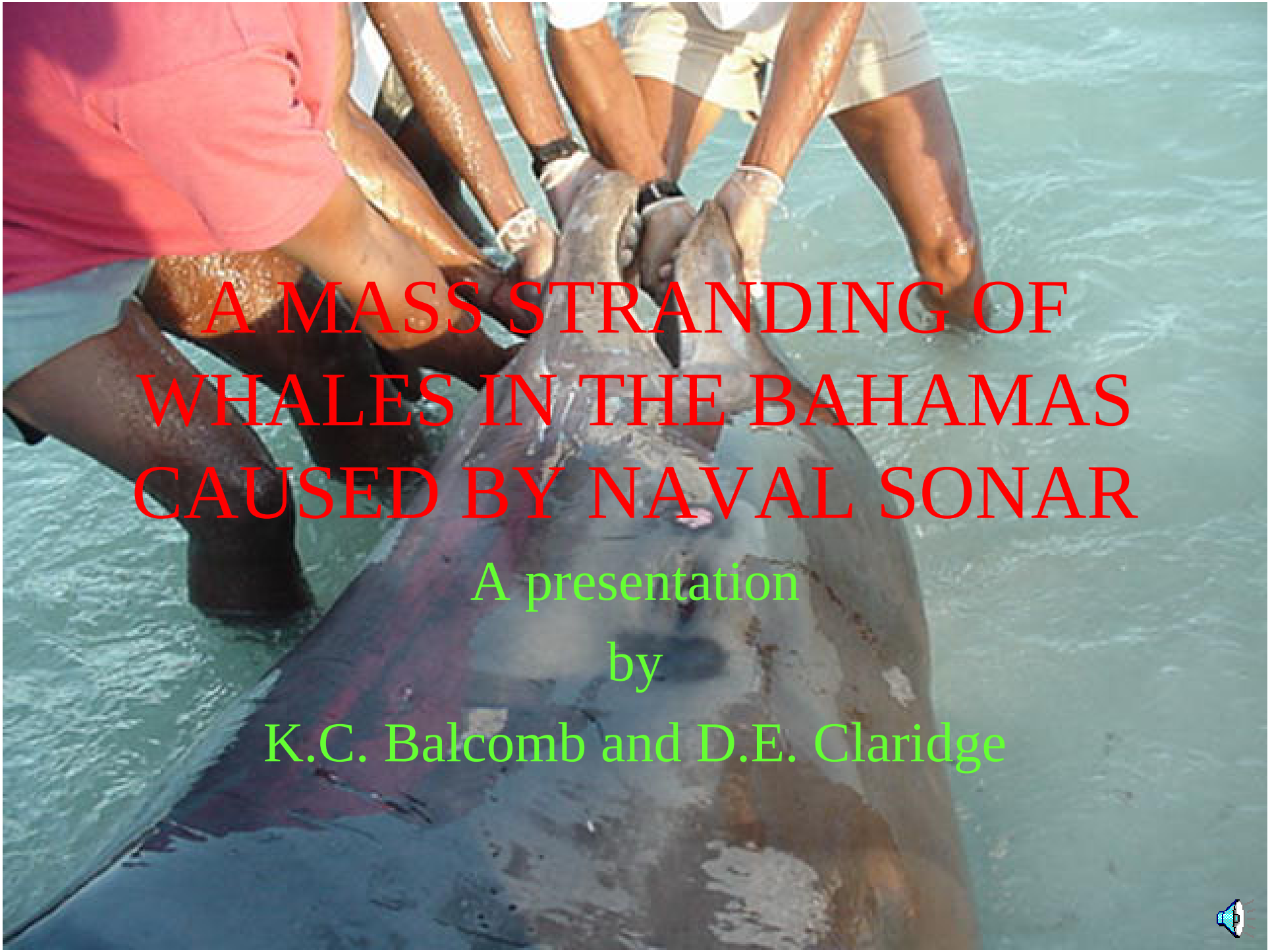
As of March 2000, we photo-identified more than 140 Dense-beaked whale (M. densirostris) individuals since, and had documented a high rate of return to the Abaco study area, typically around the 500 meter isobath.

Distribution map of beaked whale observations by Bahamas Marine Mammal Survey, to be prepared.

In 1997, we examined a young Antillean beaked whale (M. europaeus) that live stranded near Nassau, and was collected by Department of Fisheries personnel.

We didn’t think much about it, because so far as we knew beaked whale strandings were still very rare and typically solitary throughout the world, with a few exceptions.

But, on the 15th of March 2000 everything changed!

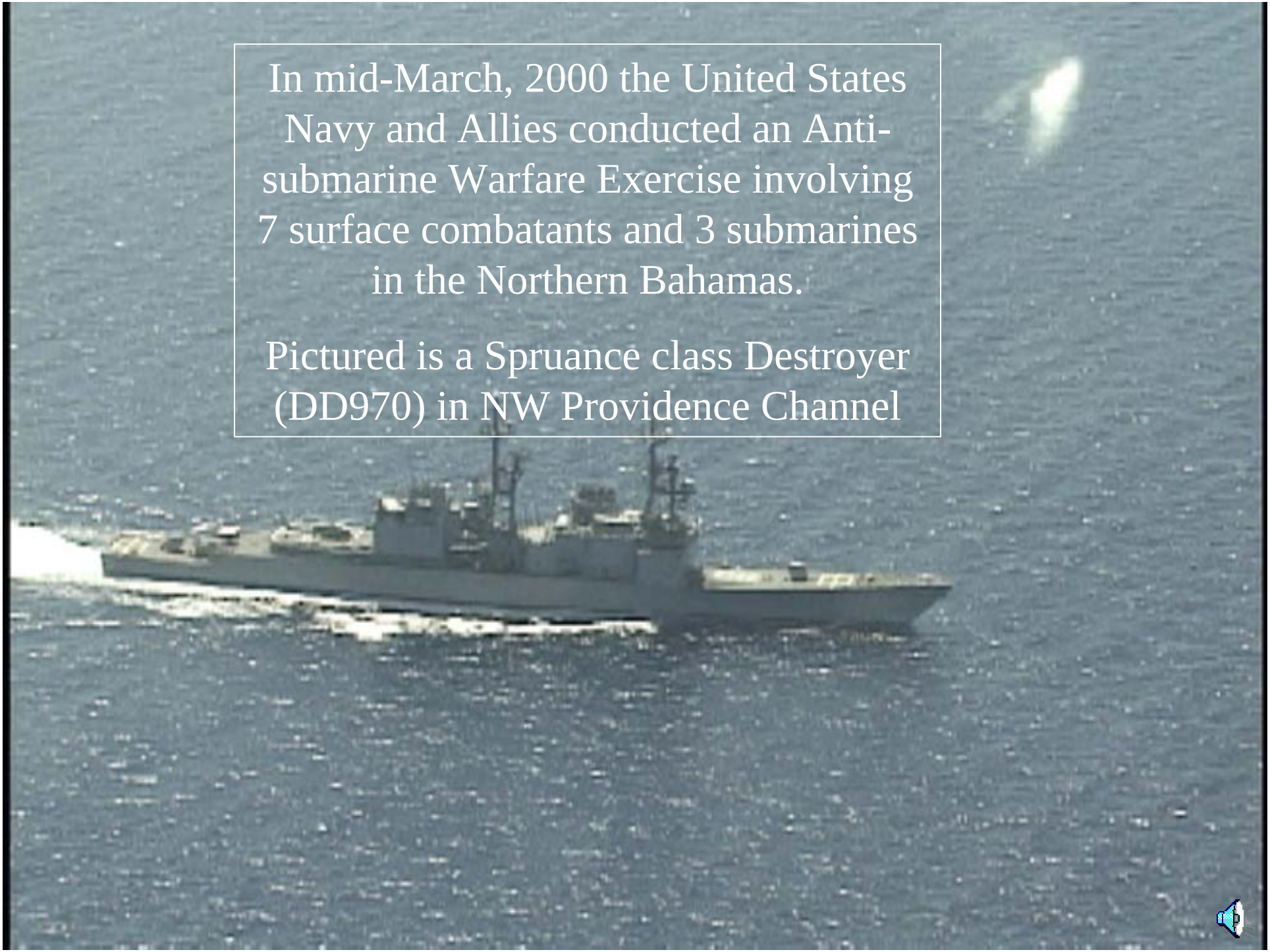


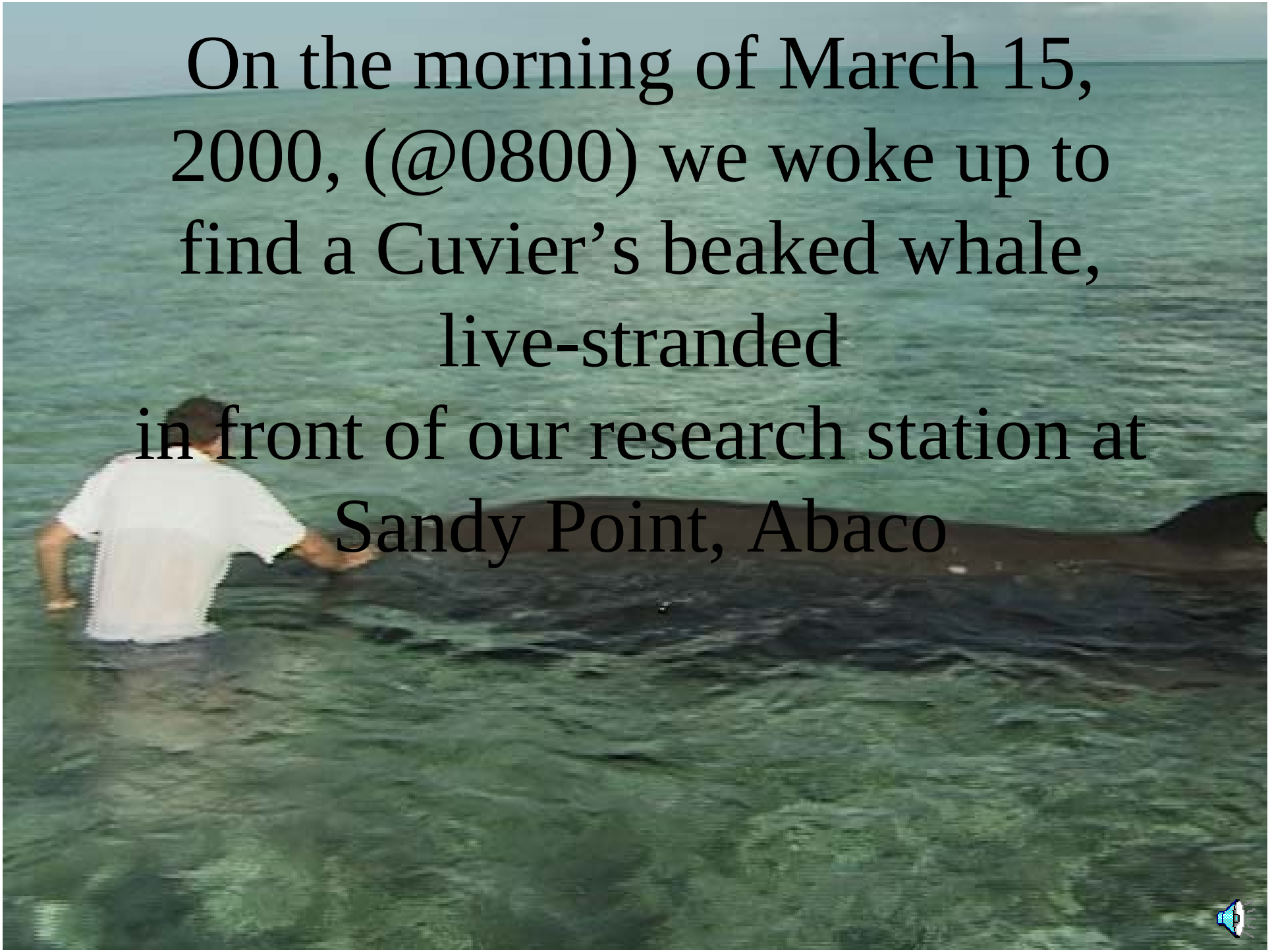
A MASS STRANDING OF WHALES IN THE BAHAMAS CAUSED BY NAVAL SONAR

A presentation

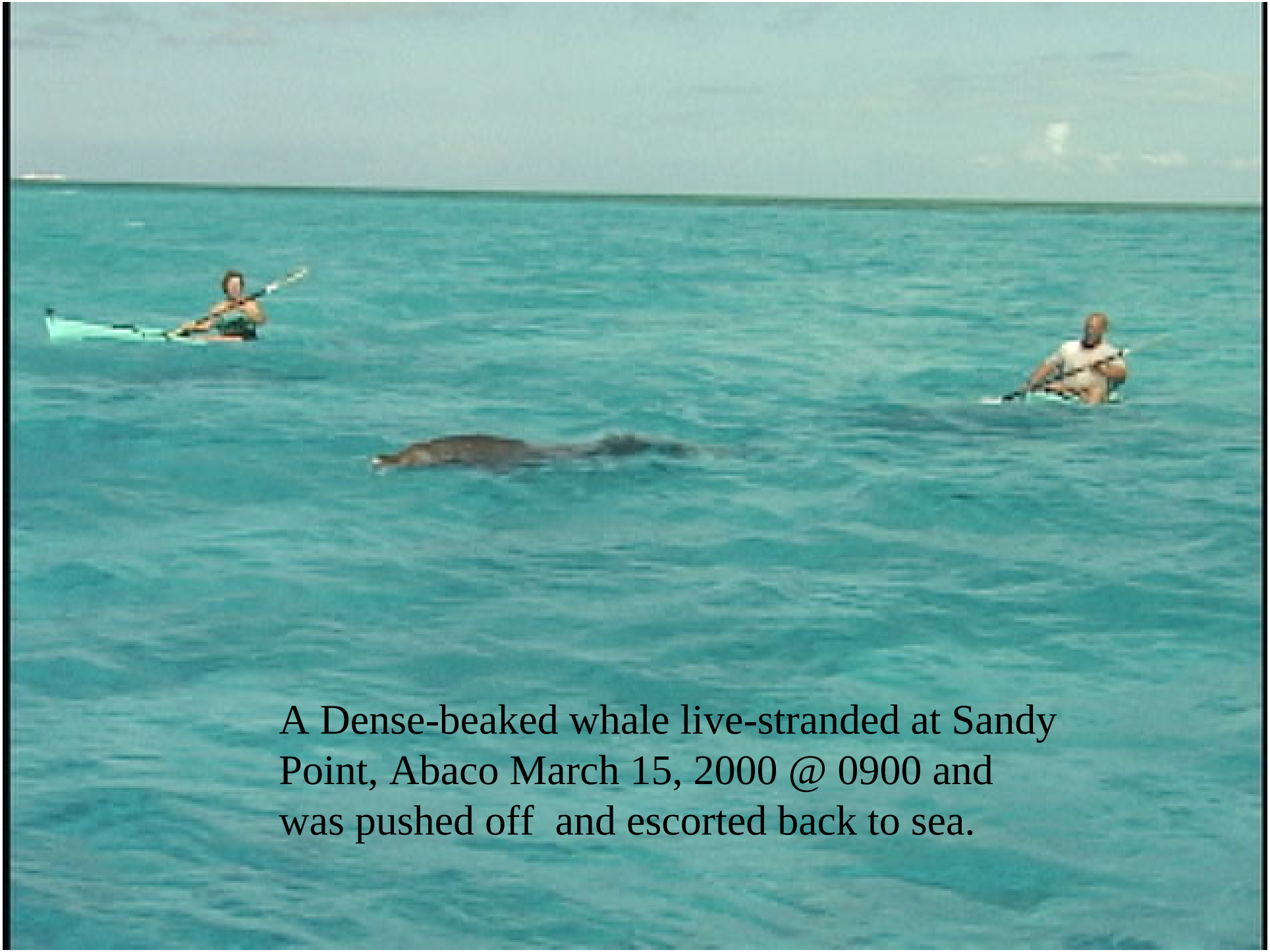
by

K.C. Balcomb and D.E. Claridge

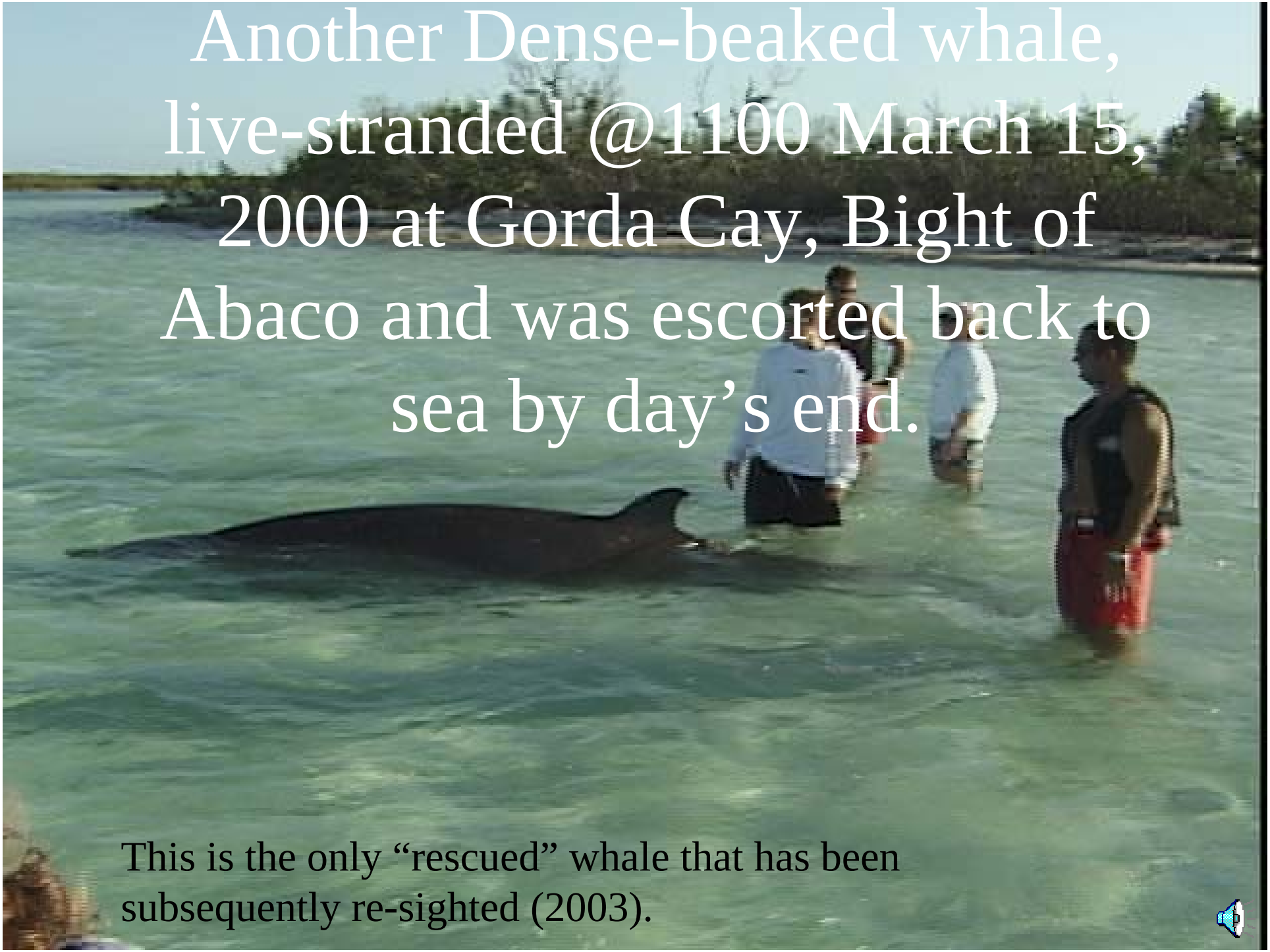

In mid-March, 2000 the United States Navy and Allies conducted an Anti-submarine Warfare Exercise involving 7 surface combatants and 3 submarines in the Northern Bahamas.
Pictured is a Spruance class Destroyer (DD970) in NW Providence Channel

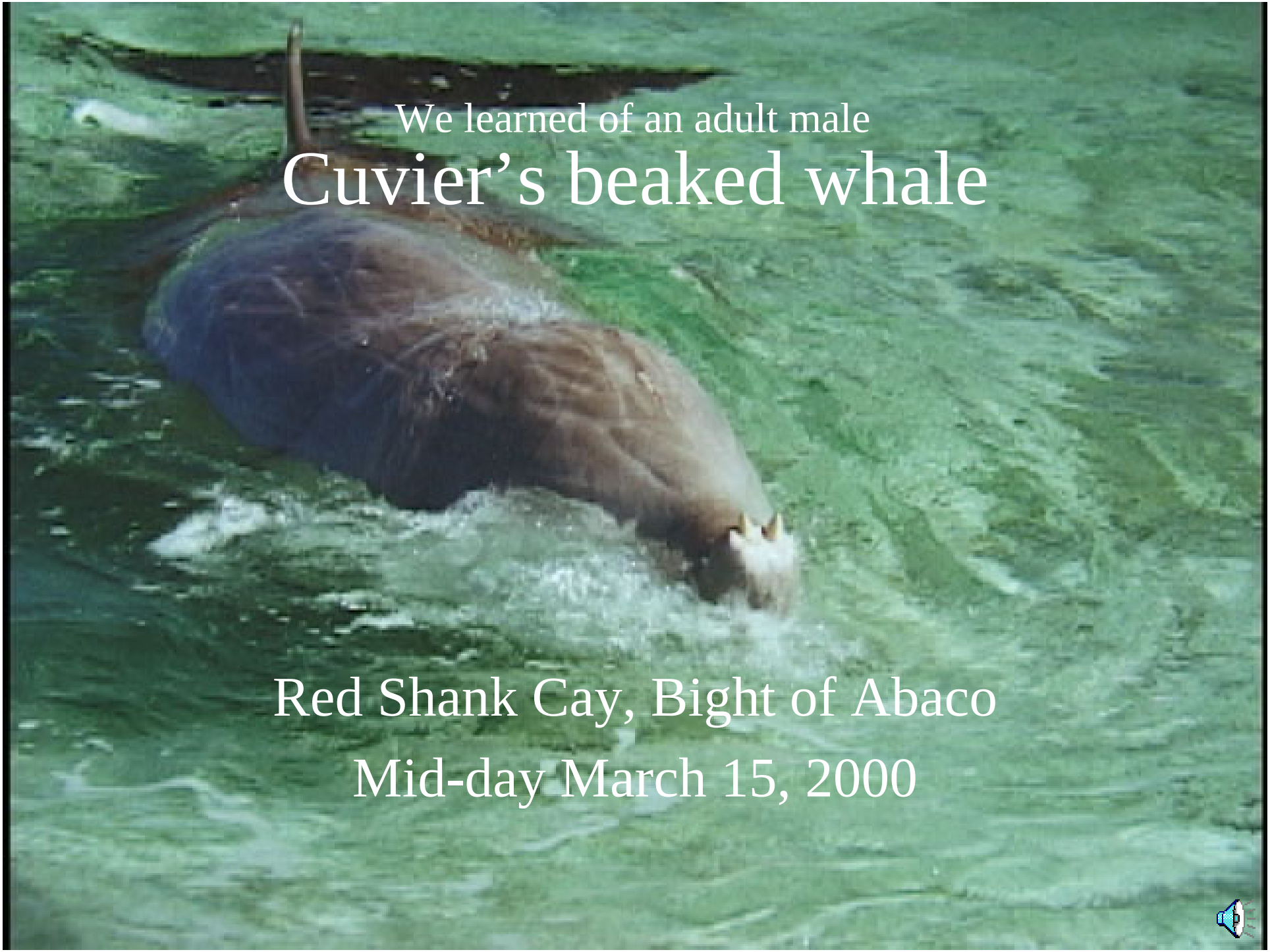

On the morning of March 15, 2000, (@0800) we woke up to find a Cuvier's beaked whale, live-stranded
in front of our research station at Sandy Point, Abaco

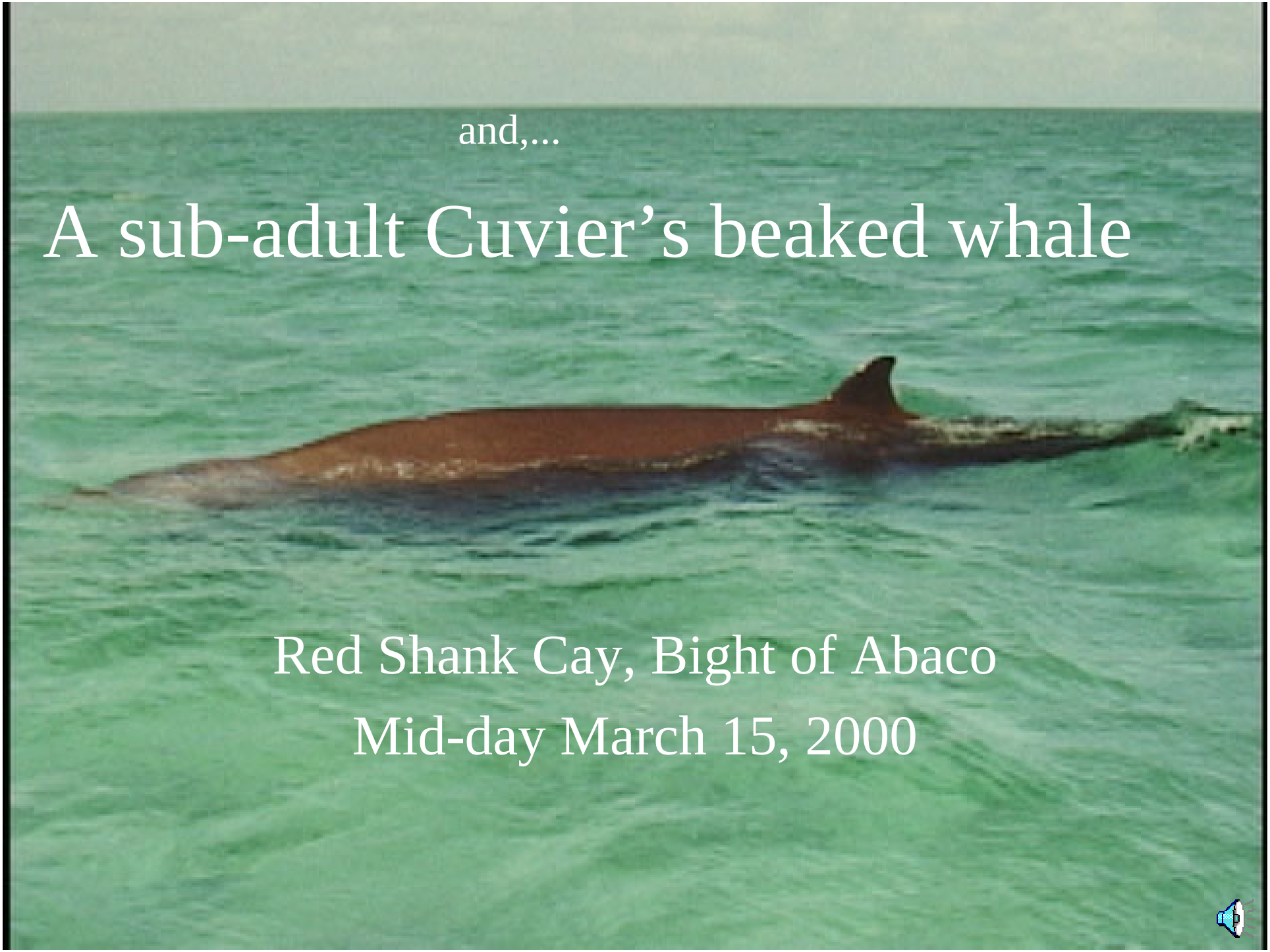

Another Cuvier's beaked whale
had live-stranded earlier
March 15, 2000@0700
Sandy Point, Abaco



A Dense-beaked whale live-stranded at Sandy Point, Abaco March 15, 2000 @ 0900 and was pushed off and escorted back to sea.


Another Dense-beaked whale, live-stranded @1100 March 15, 2000 at Gorda Cay, Bight of Abaco and was escorted back to sea by day's end.
This is the only "rescued" whale that has been subsequently re-sighted (2003).


We learned of an adult male
Cuvier’s beaked whale
Red Shank Cay, Bight of Abaco
Mid-day March 15, 2000

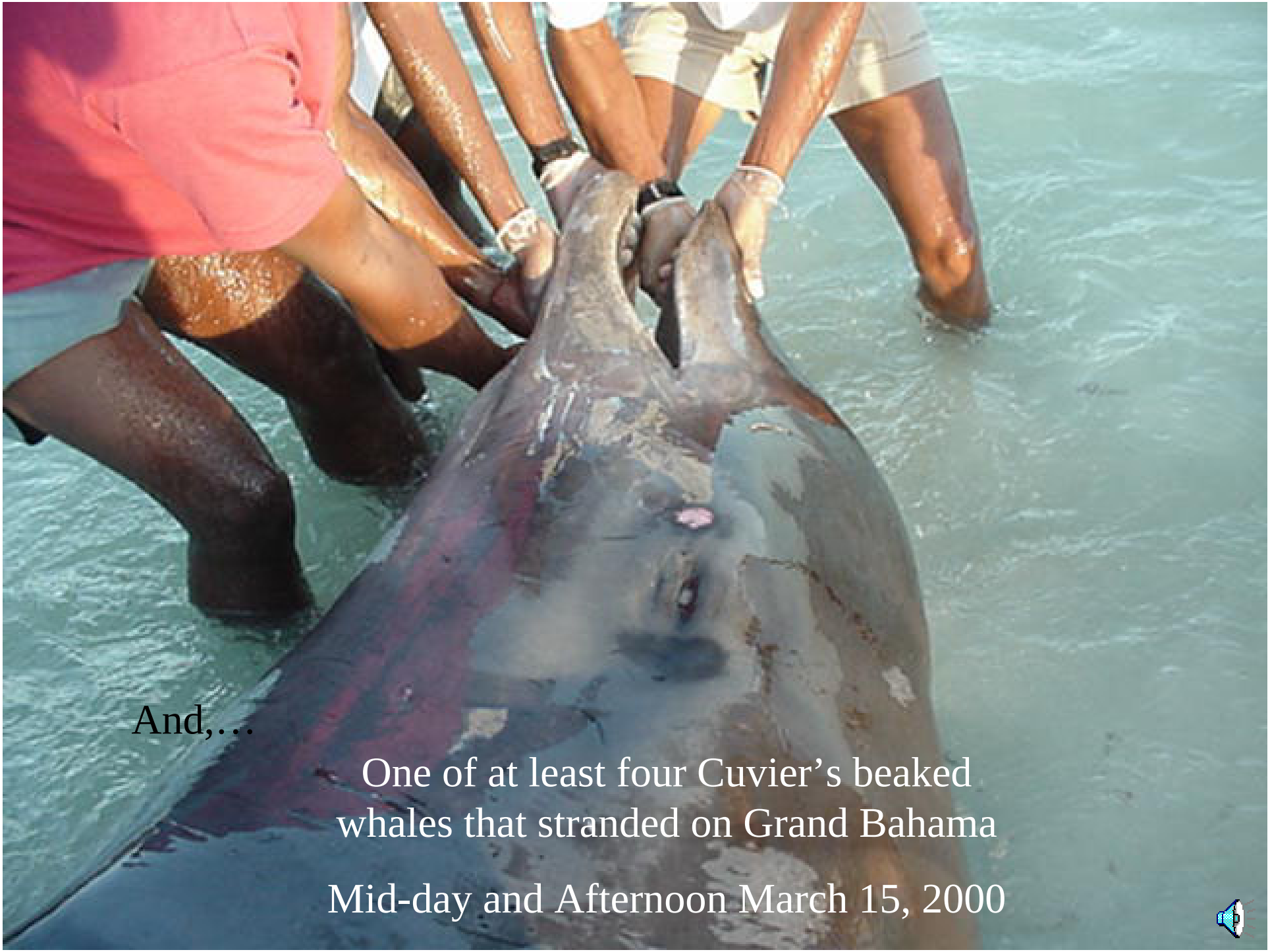


and,...

A sub-adult Cuvier's beaked whale

Red Shank Cay, Bight of Abaco

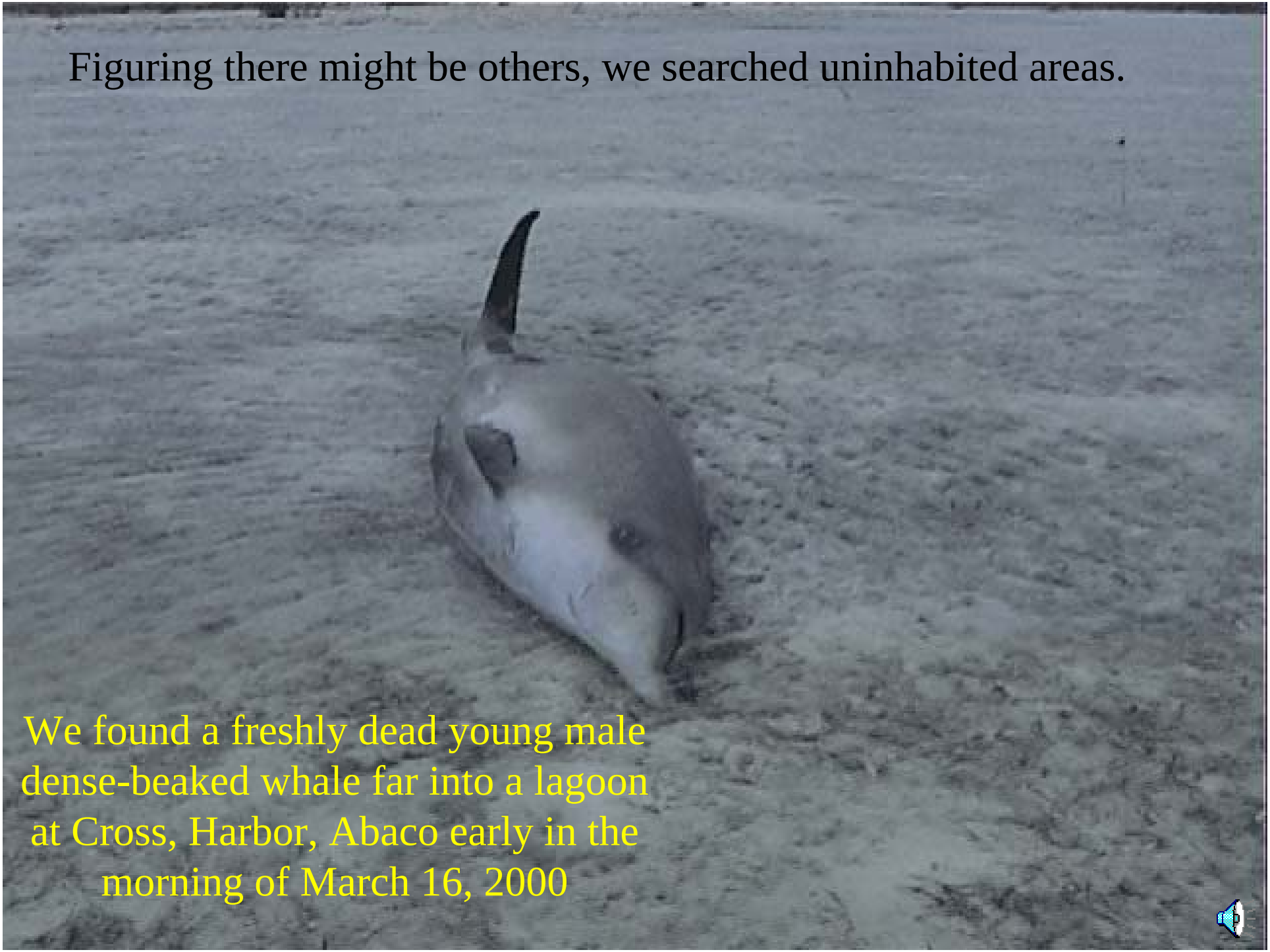
Mid-day March 15, 2000


And,…
One of at least four Cuvier's beaked whales that stranded on Grand Bahama
Mid-day and Afternoon March 15, 2000


And,…
A Minke Whale, Royal Island, Eleuthera
Morning March 15, 2000

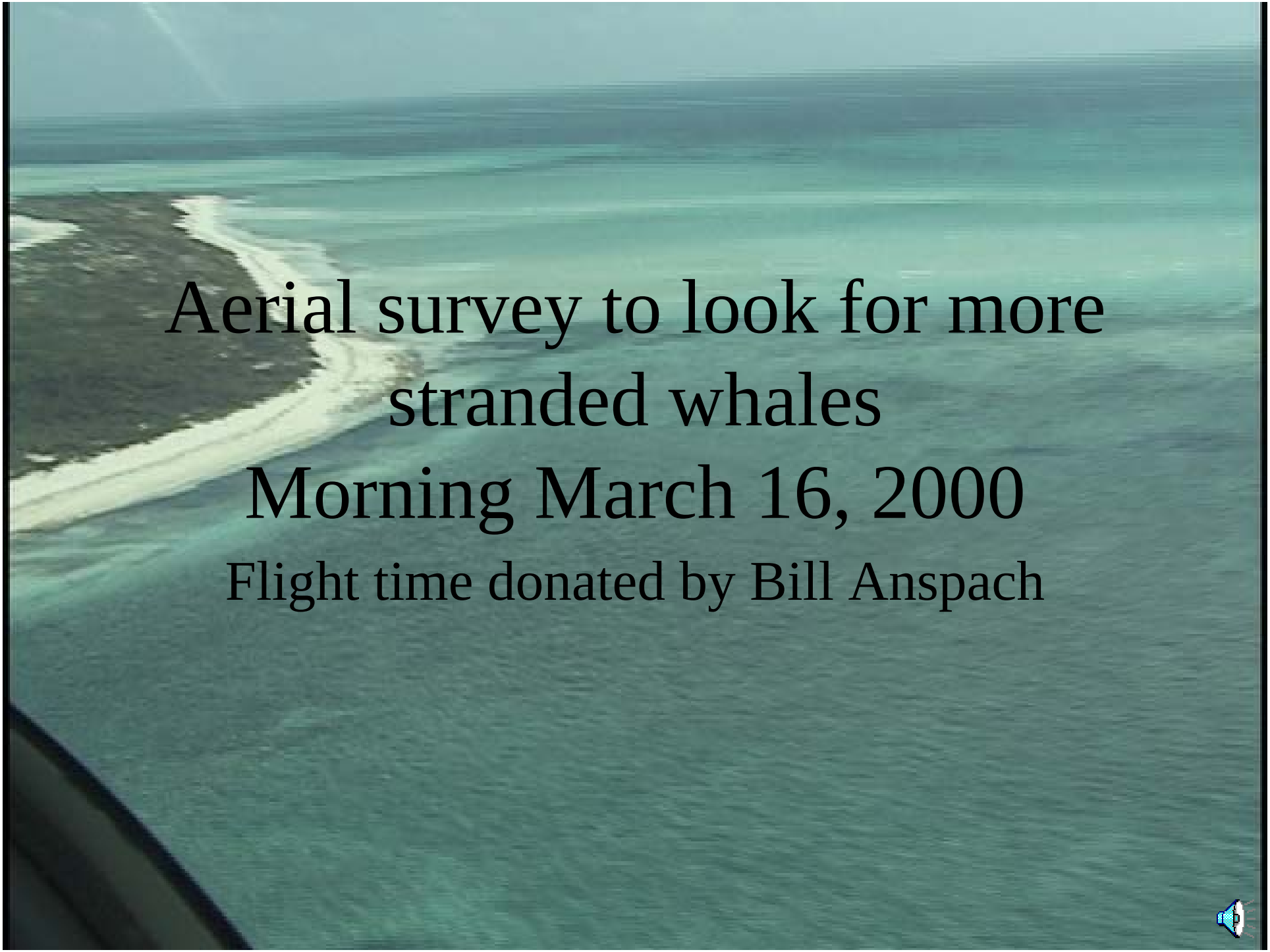

And,…
Another Minke whale that swam in circles in the harbor at Royal Island for two days March 15-17, 2000
MAR 17 2000

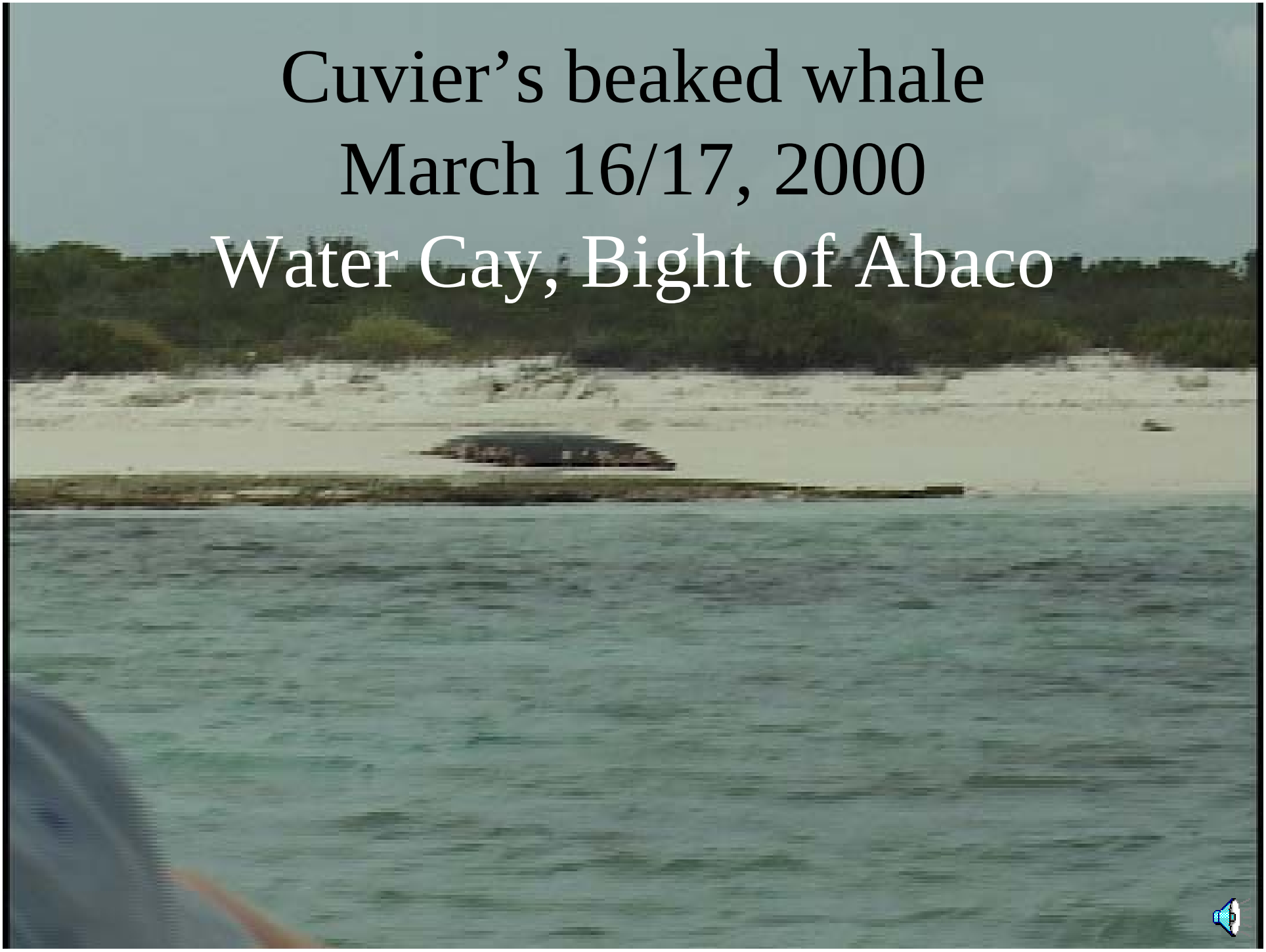
Figuring there might be others, we searched uninhabited areas.



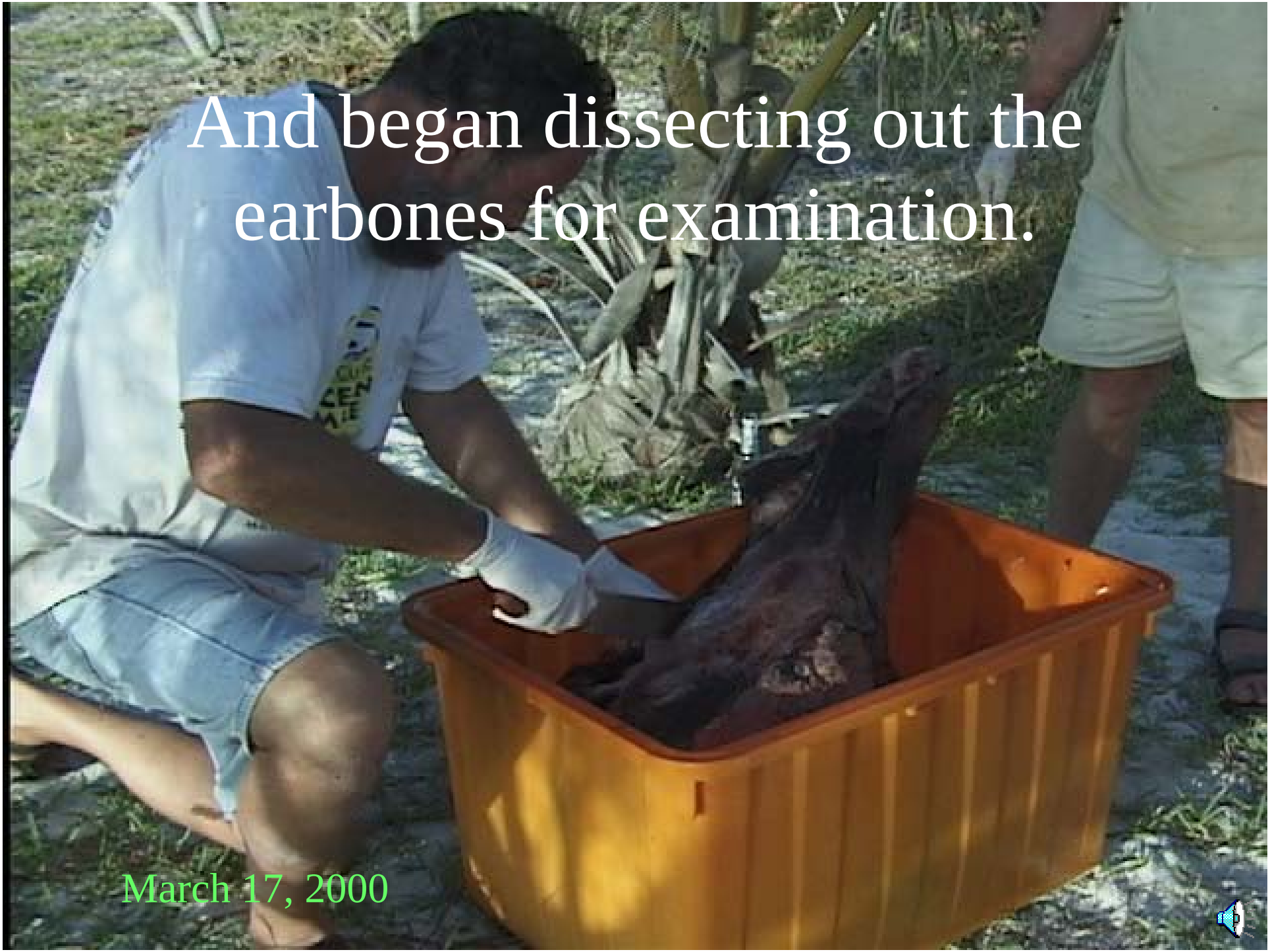
We found a freshly dead young male dense-beaked whale far into a lagoon at Cross, Harbor, Abaco early in the morning of March 16, 2000

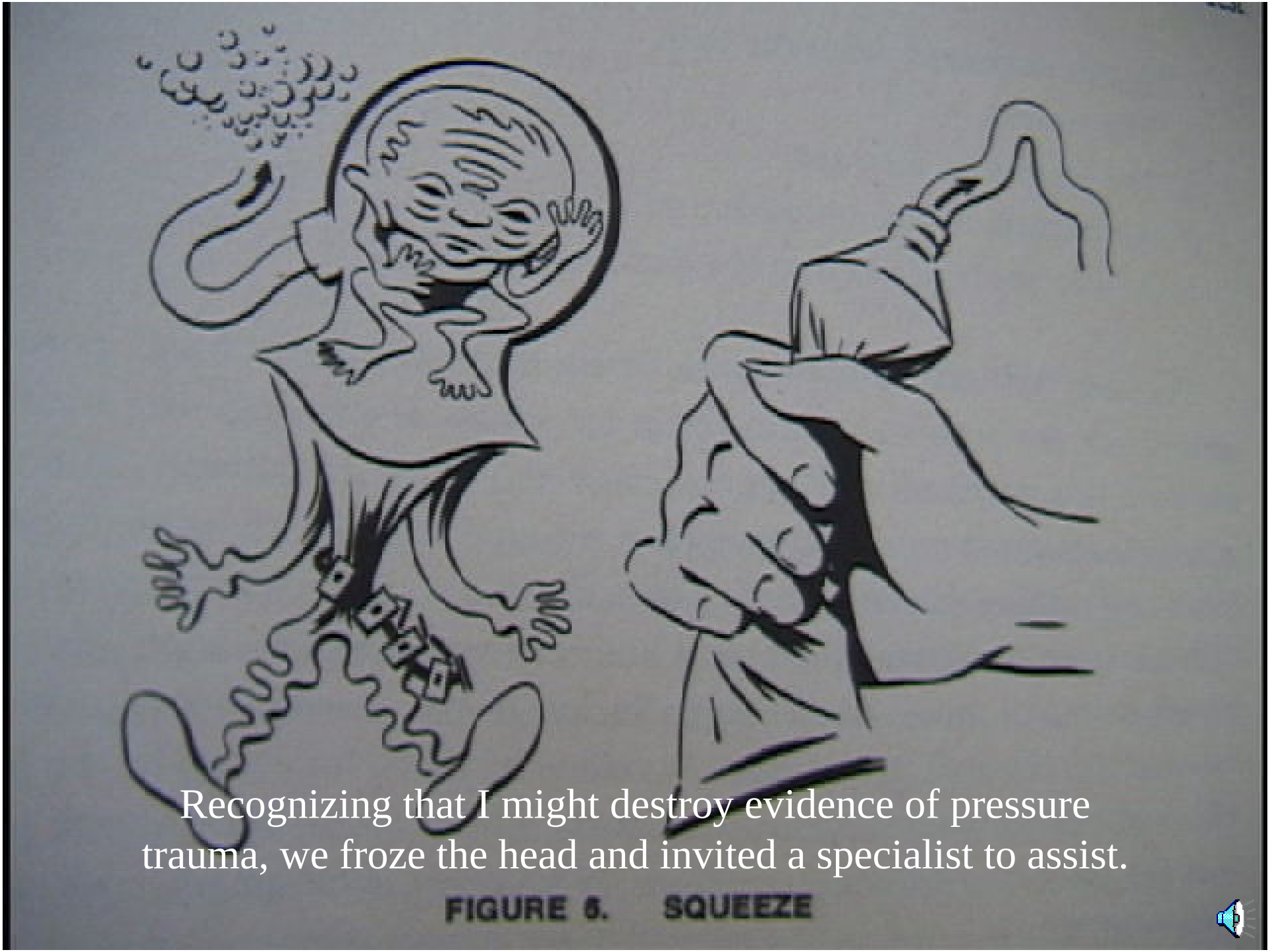

We transported the Cross Harbor Whale to a
Necropsy - March 16, 2000
I immediately severed, iced and froze the head for later forensic examination.


Aerial survey to look for more stranded whales
Morning March 16, 2000
Flight time donated by Bill Anspach


Cuvier’s beaked whale
March 16/17, 2000
Water Cay, Bight of Abaco


We collected the head of
the Water Cay whale on
March 17, 2000


And began dissecting out the earbones for examination.
March 17, 2000



Recognizing that I might destroy evidence of pressure trauma, we froze the head and invited a specialist to assist.

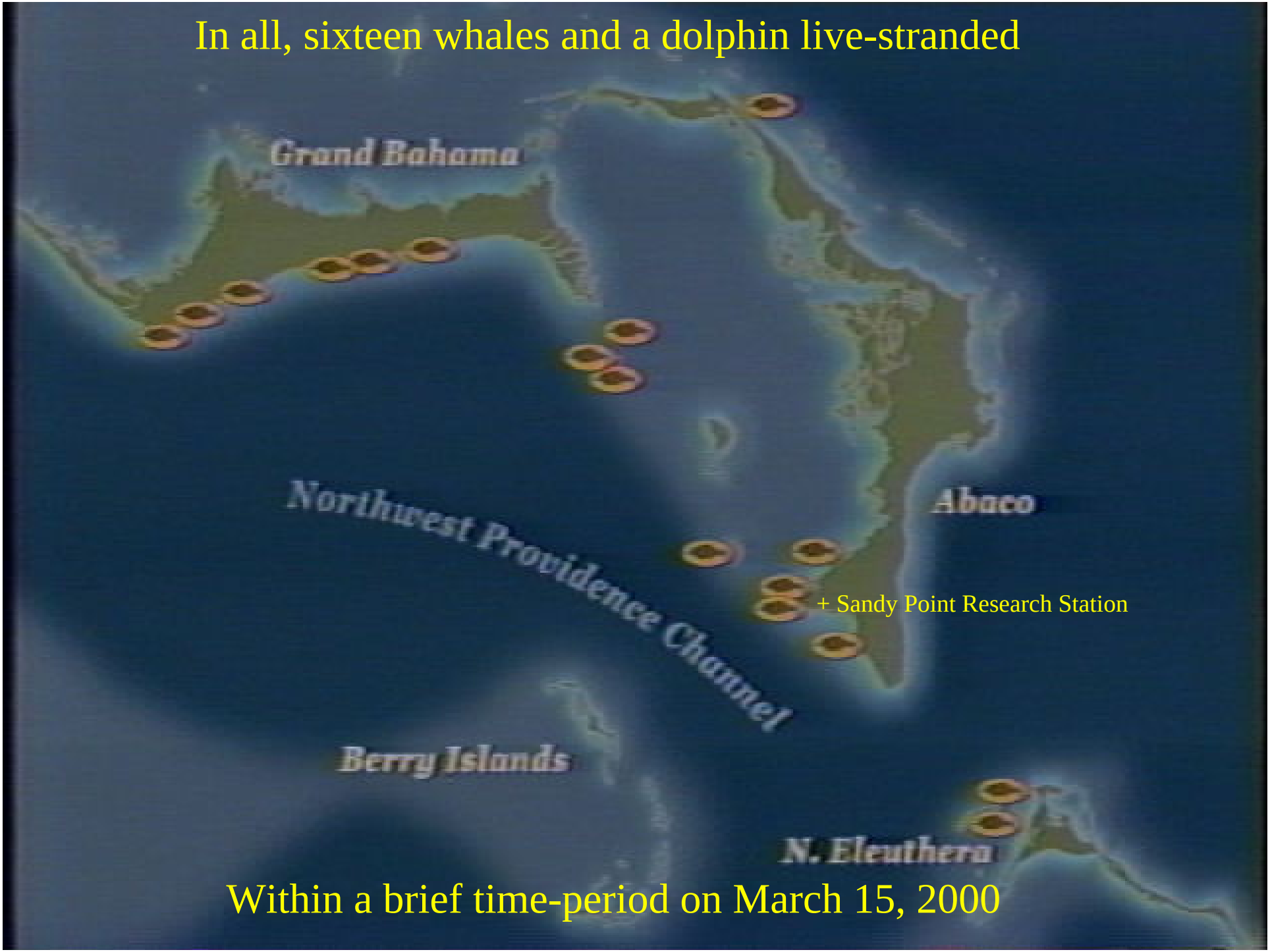
FIGURE 6. SQUEEZE


Then, I went to Grand Bahama to help necropsy.
Cuvier's beaked whale stranded on Grand Bahama, March 15 exhumed March 19, 2000
The specialists arrived March 19/20 for the necropsy.


These whales were pretty
rotten by then,…

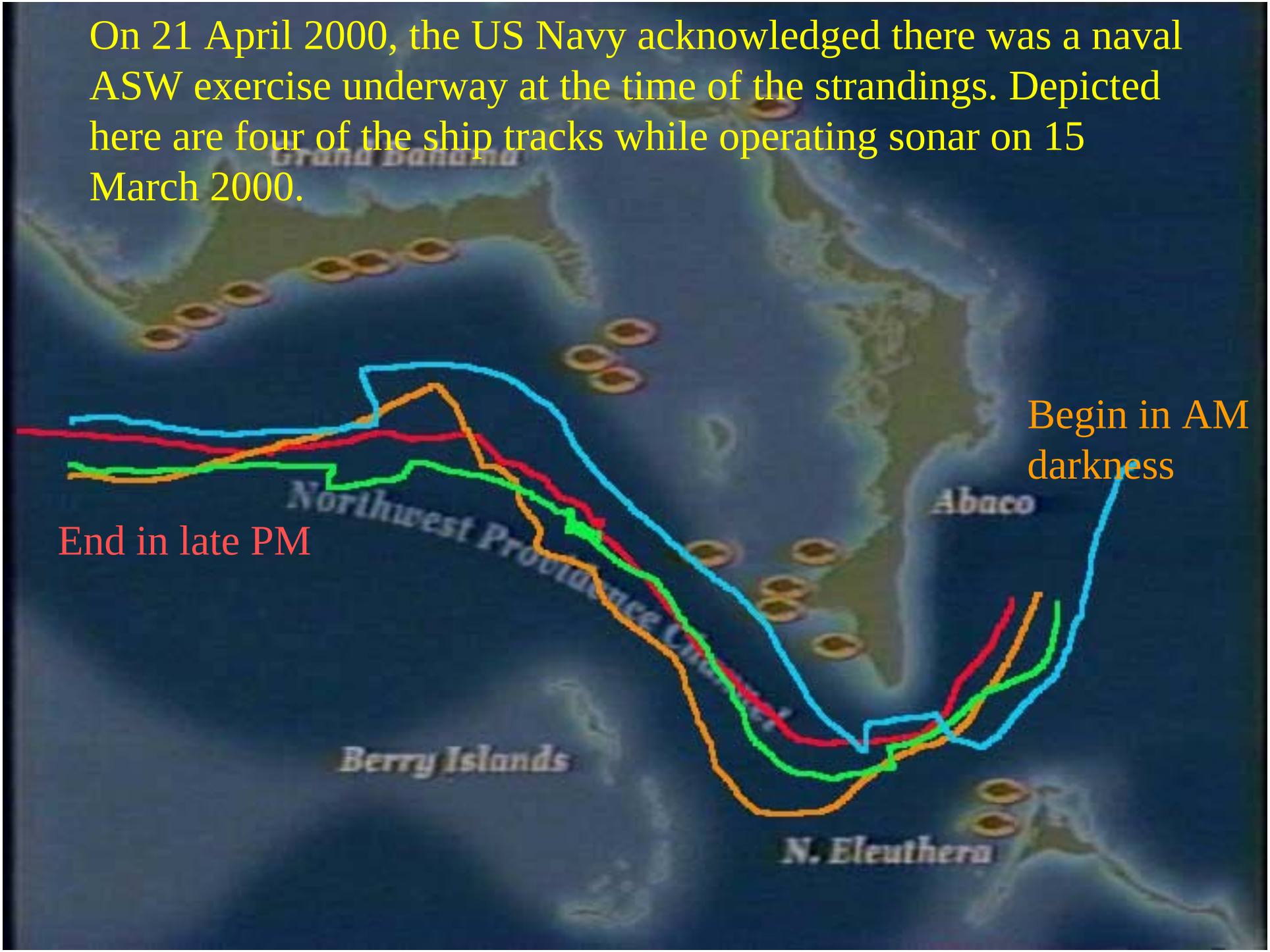

But, two of the specialists agreed to come to Abaco to examine our fresh-frozen specimen from Water Cay.
Peribullar Sinus and earbones
March 21, 2000

In all, sixteen whales and a dolphin live-stranded



Within a brief time-period on March 15, 2000

On 21 April 2000, the US Navy acknowledged there was a naval ASW exercise underway at the time of the strandings. Depicted here are four of the ship tracks while operating sonar on 15 March 2000.



Why?


The fresh heads were delivered to Harvard Medical School for UHR-CT scans.
CT image courtesy Dr. D.E. Ketten, Woods Hole Oceanographic Institution and Harvard Medical School

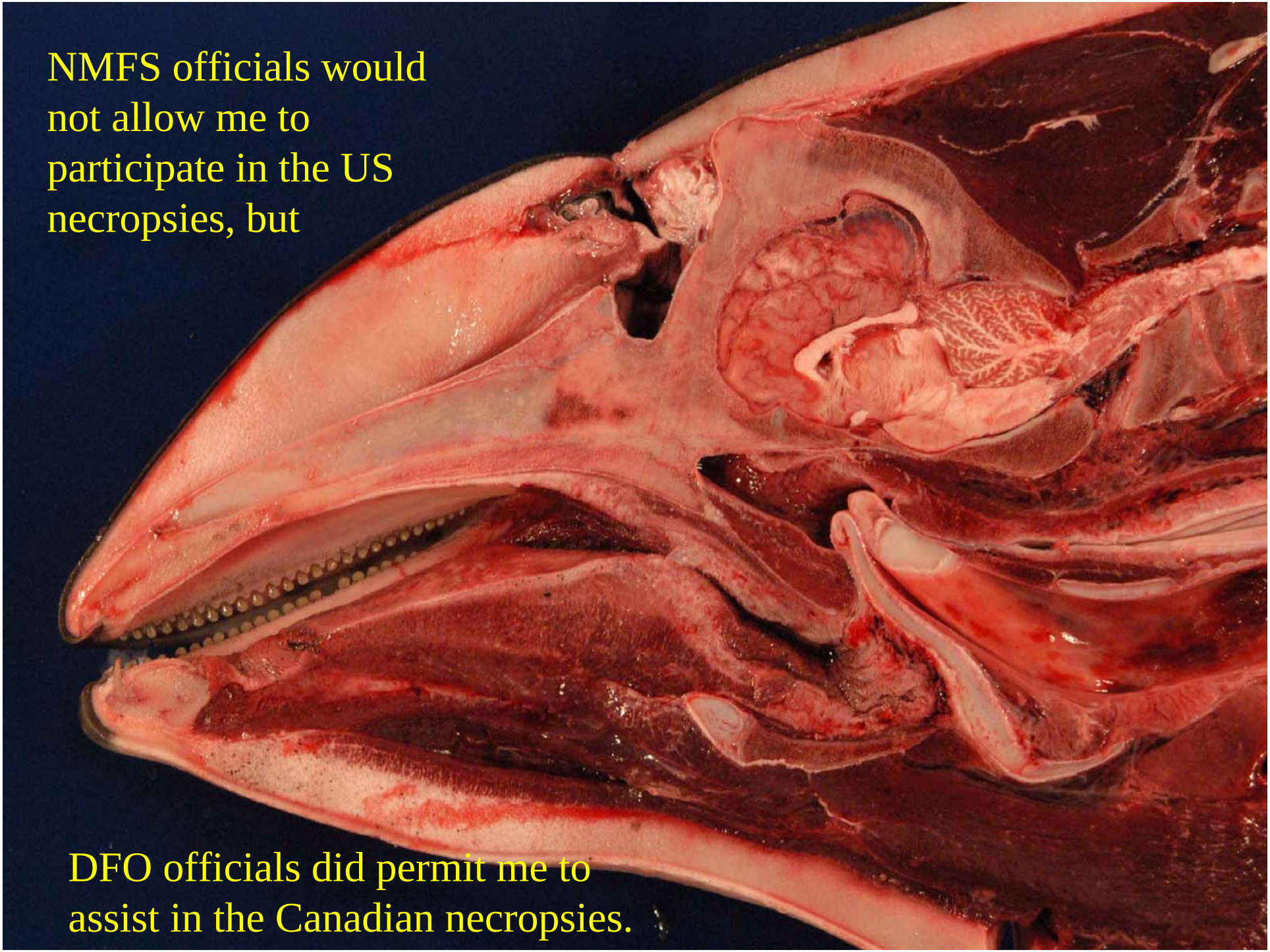
USS “Shoup” operating SSQ53C sonar in Haro Strait, 5 May 2003

All experienced observers and researchers that witnessed the “USS Shoup” incident agree that the whales’ behavior was most unusual, and seemed “distressed” while the sonar was being operated. At CPA (closest point of approach, pictured) of “USS Shoup” to the whales, the received levels of the sonar signals in the vicinity of the whales was measured at approximately 155 dB re 1uPA. At CPA, the whales split into two groups and went in opposite directions. Hours later, after the sonar had silenced, the whales regrouped. The whales are still alive as far as we know.

At minke whale was observed to flee rapidly with surface lunges “porpoising” away from “USS Shoup”. Its fate is unknown.

Every porpoise observed in Haro Strait while the sonar operated was almost continuously at the surface “porpoising” rapidly away from “USS Shoup”.

Sixteen porpoises that stranded before and after the 5th of May have been examined by necropsy. The results of these examinations are the subject of a report by the US National Marine Fisheries Service, currently being internally reviewed (as of 30 Jan 2004) before release.


NMFS officials would not allow me to participate in the US necropsies, but
DFO officials did permit me to assist in the Canadian necropsies.

Perhaps the necropsy results will further our understanding of Sound Impacts on marine mammals.

Then what?